Trend Study 15-10-99

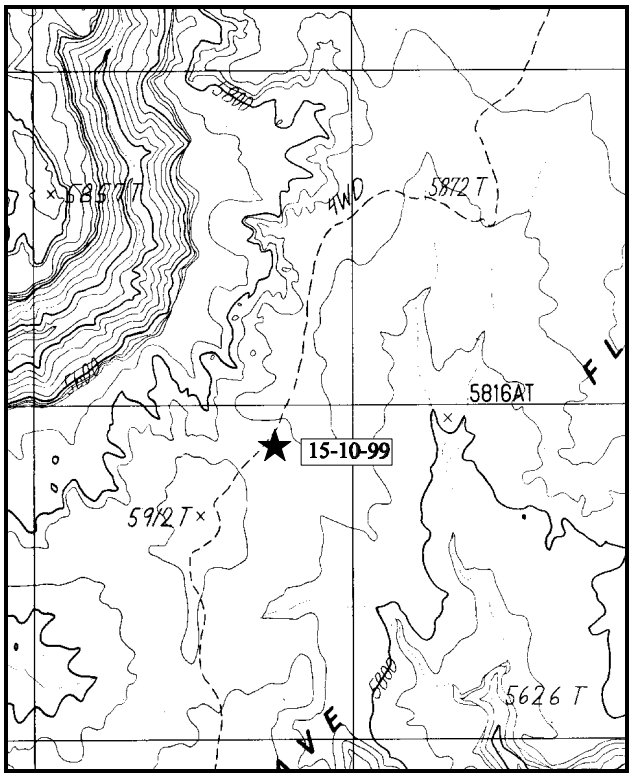
Study site name: Cave Flat . Range type: Big Sagebrush-Grass .

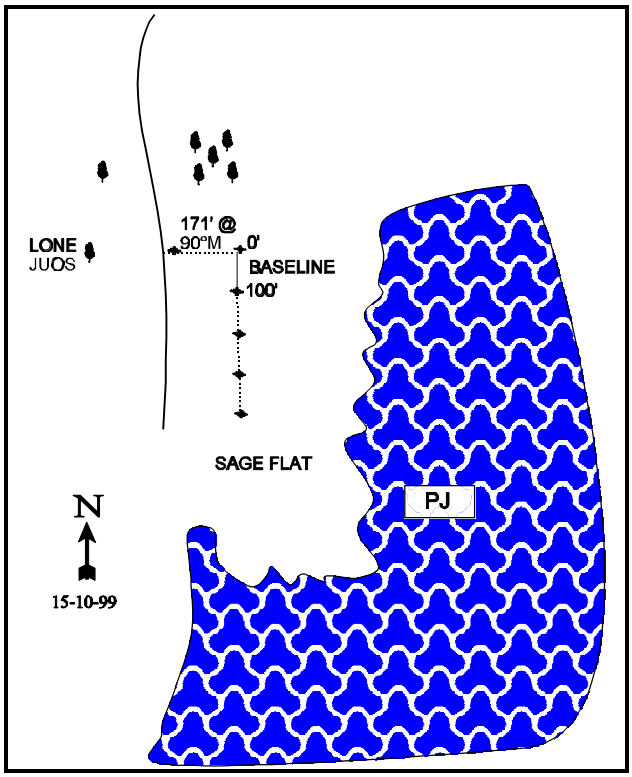
Compass bearing: frequency baseline 195°M.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Cave Flat Chaining (transect 15-9), continue south along Bullfrog Creek for 2.15 miles to a faint fork. Stay right. Go 0.7 miles to another faint intersection and stay right. Continue 0.15 miles into the large sage flat to the witness post on the left side of the road (a 2-foot tall piece of angle iron). The 0-foot baseline stake, a 2-foot tall fencepost, tagged #7126, is 171 feet bearing 90°M from the witness post. The transect runs southwest from there.





Map Name: Cave Flat Diagrammatic Sketch

Township 33S , Range 9E , Section unsurveyed UTM 4198225.664 N, 509689.547 E

DISCUSSION

Trend Study No. 15-10 (38-10)

The Cave Flat study is located in a Wyoming big sagebrush flat which is surrounded by a low elevation pinyon-juniper woodland (5,800 ft). This is considered a key wintering area for buffalo and deer. The terrain overall is fairly level, gradually sloping (0-3%) to the southwest. However, the immediate area where the site is established gently slopes to the northeast. The average annual precipitation for this area is estimated at 10 inches. A road runs through the middle of the flat, but it is rarely traveled. The area is inaccessible by vehicle when Bullfrog Creek washes out the road at the turn to Bullfrog. The region does have coal deposits, but as of yet, there has not been any mining activity in this remote area. Current use of the area by wildlife and livestock is light. Pellet group data from 1999 estimates 4 deer and 8 cow days use/acre (10 ddu/ha and 20 cdu/ha). Buffalo use was estimated at 28 days use/acre (69 bdu/ha) in the 1999 transect counts.

Soils at the site are a reddish, sandy loam with a neutral pH (7.2). There is a distinct hardpan, and the estimated stoniness index of the profile is more a reflection of the hardpan than actual rock. The soils are moderately deep with an estimated effective rooting depth of nearly 15 inches. Relative cover from bare ground is high (56% in 1994, 50% in 1999), with vegetation and litter cover providing the other half of the ground cover. The soil surface is loose with some rill erosion present. Slight pedestaling around shrubs was noted in 1999, however erosion remains at minimal levels due to the gentle slope. The soil is low in organic matter in the interspaces of the shrubs. Litter accumulation is beneath individual shrubs.

Wyoming big sagebrush is the key browse species. It's density was high in 1987 with an estimated 7,065 plants per acre. With the much larger sample taken in 1994 and 1999, estimated sagebrush density was 3,940 plants/acre and 4,680 plants/acre respectively. Since percent decadency was low (16%) in 1987, the change in density would be more the result of a more representative sample and not an actual major decline in density. Thirty-eight percent of the sagebrush sampled in 1987 were heavily hedged and 75% displayed poor vigor. By 1994, no shrubs displayed heavy use and only 16% were in poor vigor. Data from 1999 indicate 10% of the plants displaying heavy use and 5% are poor in vigor. In 1994, 47% of the decadent plants were classified as dying, this number decreasing to 41% in 1999. Percent decadency has decreased substantially from 30% in 1994 to 9% in 1999. Biotic potential is low, but recruitment from young plants should be adequate to replace the proportion of the population that is dying out. Of concern is the large amount of broom snakeweed. This species represents the most numerous shrub with an estimated density of 6,740 plants/acre in 1994, increasing to 10,000 plants/acre in 1999. Age class analysis indicates a mostly mature population with moderate recruitment (16% young plants).

Herbaceous understory plants account for 47% of the total vegetative cover in 1999, an increase from 35% in 1994. Warm season grasses consisting primarily of blue grama and galleta are the key species. Blue grama significantly increased in nested frequency between 1994 and 1999, while galleta slightly decreased during this same time period. Cheatgrass, an annual, significantly increased in nested frequency in 1999 while providing the most herbaceous cover of any other single species. Forbs are insignificant with wooly plantain providing 99% of the forb cover and significantly increasing in nested frequency in 1999.

1994 TREND ASSESSMENT

Protective ground cover on the site is minimal, but has improved since 1987. Percent bare ground is still high at 56% relative cover with nested frequency values for vegetation (326) and litter (369) indicating well dispersed soil protection. This, along with the gentle terrain, prohibits erosion from being a major problem on this site. Trend for soil is slightly up, but still in poor condition. The browse trend is stable with a healthy population of Wyoming big sagebrush which has a relatively higher decadency rate (30%), but is less heavily hedged with a high biotic potential (34%). On the down side, broom snakeweed is the most abundant shrub on the site and age class analysis indicates an expanding population with a biotic potential of 32%. Even with

it's high density, broom snakeweed only makes up 19% of the total browse cover. The herbaceous understory is dominated by warm season grasses, with perennial forbs severely lacking on the site. Sum nested frequencies of perennial grasses and forbs combined have slightly declined.

TREND ASSESSMENT
soil - slightly improved, but still poor condition
browse - stable, but with broom snakeweed still increasing
herbaceous understory - slightly declining for perennial species, lacking forbs

1999 TREND ASSESSMENT

Trend for soil is stable. Although bare ground remains at a high level, protective cover from vegetation and litter increased since 1994. The gentle slope and herbaceous cover minimize erosion. Sagebrush trend is up with decreased decadency, light to moderate utilization on most plants, improved vigor, and adequate recruitment to replace dying individuals. One negative aspect for browse trend is the increase in broom snakeweed. The population appears to be stabilizing with biotic potential going from 32% in 1994, to currently where it is at only 1%. The population is mostly mature plants at this time (83%). Trend for browse is slightly up overall. Trend for herbaceous understory is slightly down due a decrease in sum of nested frequency for perennial species and an increase in sum of nested frequency for annual species. Cheatgrass is expanding over the site and is a cause for concern. Forbs are insignificant and severely lacking in diversity.

TREND ASSESSMENT
soil- stable, but poor condition
browse- slightly up
herbaceous understory- slightly down with annuals providing almost 60% of the cover

HERBACEOUS TRENDS --
Herd unit 15 , Study no: 10

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'87	'94	'99	'87	'94	'99	'94	'99
G	Agropyron cristatum	-	2	-	-	1	-	.00	-
G	Aristida purpurea	-	5	-	-	2	-	.03	-
G	Bouteloua gracilis	b160	a89	ab116	52	32	44	4.40	3.55
G	Bromus tectorum (a)	-	a158	b264	-	62	83	.43	4.57
G	Hilaria jamesii	107	100	88	41	38	32	2.53	2.23
G	Oryzopsis hymenoides	14	13	13	9	7	5	.23	.08
G	Sitanion hystrix	14	22	35	10	11	17	.13	.25
G	Sporobolus cryptandrus	a-	b27	a3	-	13	2	.28	.01
G	Vulpia octoflora (a)	-	b206	a163	-	77	63	.38	1.26
Total for Annual Grasses		0	364	427	0	139	146	0.81	5.84
Total for Perennial Grasses		295	258	255	112	104	100	7.63	6.13
Total for Grasses		295	622	682	112	243	246	8.45	11.97
F	Astragalus spp.	-	5	2	-	2	2	.01	.01
F	Erodium cicutarium (a)	-	b6	a-	-	4	-	.02	-
F	Fritillaria atropurpurea	-	3	-	-	1	-	.00	-

Type	Species	Nested Frequency '87	'94	'99	Quadrat Frequency '87	'94	'99	Average Cover % '94	'99
F	Lygodesmia spp.	-	8	-	-	4	-	.02	-
F	Plantago patagonica (a)	$_{a}$84	$_{b}$147	$_{c}$212	32	52	70	.75	2.04
F	Sphaeralcea coccinea	$_{ab}$10	$_{b}$11	$_{a}$1	5	7	1	.03	.00
Total for Annual Forbs		84	153	212	32	56	70	0.77	2.04
Total for Perennial Forbs		10	27	3	5	14	3	0.07	0.01
Total for Forbs		94	180	215	37	70	73	0.84	2.06

Values with different subscript letters are significantly different at % = 0.10

BROWSE TRENDS --
Herd unit 15 , Study no: 10

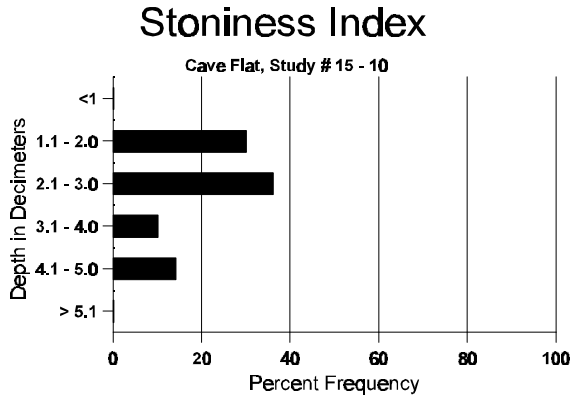
Type	Species	Strip Frequency '94	'99	Average Cover % '94	'99
B	Artemisia tridentata wyomingensis	78	78	12.73	12.86
B	Atriplex canescens	0	1	-	-
B	Atriplex confertifolia	2	0	-	-
B	Chrysothamnus nauseosus	0	0	-	-
B	Chrysothamnus viscidiflorus	0	1	-	-
B	Coleogyne ramosissima	0	4	-	-
B	Eriogonum microthecum	3	0	3.23	1.61
B	Gutierrezia sarothrae	79	78	-	-
B	Juniperus osteosperma	0	1	.03	.18
B	Opuntia spp.	13	25	1.08	1.14
Total for Browse		175	188	17.07	15.80

BASIC COVER --
Herd unit 15 , Study no: 10

Cover Type	Nested Frequency '94	'99	Average Cover % '87	'94	'99
Vegetation	326	353	4.00	24.37	24.81
Rock	35	3	0	.06	.00
Pavement	65	71	0	.14	.28
Litter	369	348	29.50	15.71	23.39
Cryptogams	8	4	0	.38	.04
Bare Ground	370	354	66.50	51.41	48.55

SOIL ANALYSIS DATA --
Herd Unit 15, Study # 10, Study Name: Cave Flat

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.6	62.8 (15.5)	7.2	63.3	18.2	18.6	0.9	9.2	105.6	0.4



PELLET GROUP DATA --
Herd unit 15 , Study no: 10

Type	Quadrat Frequency '94	Quadrat Frequency '99
Rabbit	24	36
Deer	6	18
Cattle	-	4
Buffalo	3	5

Pellet Transect Days Use/Acre (ha) '99
N/A
4 (10)
8 (20)
28 (69)

BROWSE CHARACTERISTICS --
Herd unit 15 , Study no: 10

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	66	-	-	-	-	-	-	-	-	66	-	-	-	1320			66
	99	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	87	18	11	20	-	-	-	-	-	-	13	-	36	-	3266			49
	94	33	-	-	-	-	-	-	-	-	21	12	-	-	660			33
	99	26	12	5	-	2	-	-	-	-	43	-	2	-	900			45
M	87	5	19	16	-	-	-	-	-	-	8	5	27	-	2666	22	26	40
	94	102	2	-	-	-	-	-	-	-	17	84	2	1	2080	17	29	104
	99	110	48	8	1	-	-	-	-	-	167	-	-	-	3340	19	33	167
D	87	5	8	4	-	-	-	-	-	-	-	-	13	4	1133			17
	94	56	4	-	-	-	-	-	-	-	2	30	-	28	1200			60
	99	7	5	9	-	-	1	-	-	-	13	-	-	9	440			22
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	380			19

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	36%	38%	75%	-44%
'94	03%	00%	16%	+16%
'99	29%	10%	05%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	7065	Dec:	16%
	'94	3940		30%
	'99	4680		9%

Atriplex canescens																		
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18	22	0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24	24	0
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	1	-	-	-	1	-	-	-	20			1
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'94	00%	00%	00%	
'99	00%	100%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	0%
	'94	0		0%
	'99	20		100%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Atriplex confertifolia																		
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	1	-	-	-	-	1	-	-	-	2	-	-	-	40	11	15	2
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'87	00%	00%	00%
'94	00%	50%	00%
'99	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'94	40		-
	'99	0		-

Chrysothamnus nauseosus																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'87	00%	00%	00%
'94	00%	00%	00%
'99	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'94	0		-
	'99	0		-

Chrysothamnus viscidiflorus																		
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0	7	7	0
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	1	-	-	-	-	-	-	-	-	1	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'87	00%	00%	00%
'94	00%	00%	00%
'99	00%	00%	100%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	0%
	'94	0		0%
	'99	20		100%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Coleogyne ramosissima																		
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	3	-	1	-	-	-	-	-	-	4	-	-	-	80			4
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0	19	29	0
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'94	00%	00%	00%	
'99	00%	25%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'94	0		-
	'99	80		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Eriogonum microthecum																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'94	00%	00%	00%	
'99	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'94	60		-
	'99	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	94	-	-	14	-	-	-	-	-	108	-	-	-	2160			108
	99	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	87	11	-	-	-	-	-	-	-	-	10	-	1	-	733			11
	94	45	-	-	-	-	-	-	-	-	45	-	-	-	900			45
	99	78	-	-	1	-	-	-	-	-	79	-	-	-	1580			79
M	87	48	-	-	-	-	-	-	-	-	47	-	1	-	3200	8	8	48
	94	280	-	-	4	-	-	-	-	-	283	-	1	-	5680	8	11	284
	99	414	-	-	-	-	-	-	-	-	414	-	-	-	8280	5	7	414
D	87	6	-	-	-	-	-	-	-	-	6	-	-	-	400			6
	94	8	-	-	-	-	-	-	-	-	3	1	-	4	160			8
	99	6	-	-	1	-	-	-	-	-	2	-	1	4	140			7
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	600			30

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	03%	
'94	00%	00%	01%	+36%
'99	00%	00%	01%	+33%

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	4333	Dec:	9%
	'94	6740		2%
	'99	10000		1%

Juniperus osteosperma																		
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'94	00%	00%	00%	
'99	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'94	0		-
	'99	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
	99	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	1	-	-	-	-	-	1	-	-	2	-	-	-	40			2
	99	6	-	-	2	-	-	-	-	-	7	-	1	-	160			8
M	87	2	-	-	-	-	-	-	-	-	2	-	-	-	133	6	10	2
	94	9	-	-	-	-	-	-	-	-	6	1	2	-	180	6	34	9
	99	19	1	-	1	-	-	-	-	-	18	-	3	-	420	5	25	21
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
	99	9	-	-	-	-	-	-	-	-	3	-	6	-	180			9
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	+49%
'94	00%	00%	23%	+66%
'99	03%	00%	26%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	133	Dec:	0%
	'94	260		15%
	'99	760		24%